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U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF ENTOMOLOGY—BULLETIN No. 126.

L. O. HOWARD, Entomologist and Chief of Bureau.

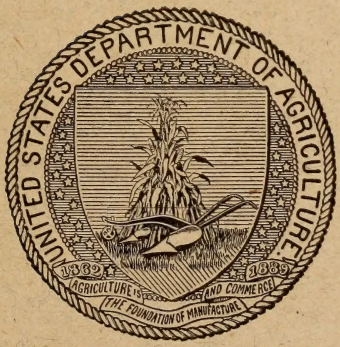
THE ABUTILON MOTH.

BY

F. H. CHITTENDEN, Sc. D.,

In Charge of Truck Crop and Stored Product Insect Investigations.

ISSUED DECEMBER 6, 1913.



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THE ABUTILON MOTH.

(*Cosmophila erosa* Hübn.)

HABITS AND RECENT INJURY.

During September, 1909, while stationed at Diamond Springs, Va., Mr. C. H. Popenoe noticed that the leaves of okra, hollyhock, and Abutilon on the farm of the Virginia Truck Experiment Station were being badly injured by the Abutilon moth (*Cosmophila erosa* Hübn.). Many larvæ and pupæ were present, defoliating the plants mentioned. The insect occurred in large numbers and in all stages, so that it actually was a serious pest. From this lot moths were reared November 13, 1909. In October of the same year Mr. E. G. Smyth, who relieved Mr. Popenoe at Diamond Springs, noticed the attacks of this species on hollyhocks and Abutilon throughout that month.

During early August, 1912, the writer noticed this species at work on the grounds of the Department of Agriculture, causing very serious injury to Abutilon. The previous year the species was quite abundant on hollyhocks, as mentioned, and "peppered" them with holes. The larval work on Abutilon was quite different. The larvæ were mostly small when observed, and their place of concealment was not at first found, but larvæ were obtained by inserting an umbrella under the leaves and shaking them down. The heat at the time the observations were made was most intense, and the insects were undoubtedly concealed.

Later, August 30, 1912, the writer observed the work of this insect on Abutilon, and in a short time the larvæ could be obtained from the leaves in great numbers, as they were rapidly defoliating the plants. After enough larvæ were taken away for rearing purposes the plants were sprayed under the writer's direction by Mr. A. B. Duckett, September 10. After the spraying, which appeared to be quite successful, it was found that a few larvæ were still present on the plants October 3. They ranged in size from quite small to half grown, and a few pupæ were still on the plants.

Mr. J. F. Strauss collected this species August 20, 1912, on *Hibiscus esculentus* at Washington, D. C. In all cases observed the 12-spotted cucumber beetle (*Diabrotica duodecimpunctata* Oliv.) caused some of the injury, while ants also invaded the open bolls, which they were devouring. He noted that one larva pupated August 21 and emerged

as adult August 29, or in 8 days. Another pupated August 21 and emerged August 30, or in 9 days. That was during a hot period, and a shorter time was taken to transform than would be necessary at a cooler time.

The opinion expressed by Riley that this is exclusively a southern species was modified somewhat by the same author when he found the eggs and larvæ quite abundantly in September, 1882, on *Abutilon avicennæ* at several localities in the District of Columbia.

On September 21 the largest larva was nearly an inch long, and on October 3 it spun up and transformed to pupa. The first moth issued October 15, and on October 16 several moths were captured at sugar. On October 22 quite a large number of larvæ of all sizes, from those just hatched to the nearly full-grown individuals, were found feeding on the same plant at Ivy City, D. C., and October 25 eggs and young larvæ were found on the leaves of *Malva rotundifolia* at Giesboro Point, D. C. The moths from these larvæ began issuing December 1, and more than a dozen had made their appearance by December 4.

In the writer's experience this species appears to prefer Abutilon to hollyhock. It does not spread to any great extent, and hibiscus may not prove to be its natural food plant.

This species was last seen on October 12, 1912, when Mr. M. M. High sent one larva found on cowpea leaves at Gulfport, Miss., and on October 31, 1912, when a moth issued from our own material at Washington, D. C.

A portion of a badly infested Abutilon plant is shown in Plate I and a skeletonized leaf in Plate II.

SYNONYMY.

This species has been described under several different names, as shown in the following synonymy, adapted from Hampson (8):

Cosmophila erosa Hübn., Zutr. Samml. exot. Schmett., vol. 2, p. 19, figs. 287, 288.
Cosmophila xanthindyma Boisd., Faun. Ent. Mad., p. 94, pl. 13, fig. 7; Moore, Lep. Ceyl., vol. 3, p. 155, figs. 1, 1 *a*, *b* (larva); C. & S. No. 2234.
Cosmophila indica Guen., Spec. Gen. Lep., Noct., vol. 2, p. 396.
Cosmophila auragoides Guen., Spec. Gen. Lep., Noct., vol. 2, p. 397.
Cirrœdia veriolosa Walk., List Lep. Ins. Brit. Mus., pt. 11, p. 750.
Cirrœdia edentata Walk., List Lep. Ins. Brit. Mus., pt. 11, p. 750.

It has, however, been generally mentioned in literature as *Anomis erosa* Hübn.

DESCRIPTION.

The moth so closely resembles the cotton moth (*Alabama argillacea* Hübn.) of the Southern States as to be readily mistaken for it by anyone familiar with the latter. The egg closely resembles that of the cotton moth. The larva bears some resemblance to that of the cotton moth, but more to that of the cabbage looper (*Autographa brassicæ* Riley), especially on account of the structure of the legs, as

ABUTILON PLANT, SHOWING ALMOST COMPLETE DEFOLIATION BY LARVÆ OF THE ABUTILON MOTH (COSMOPHILA EROSA) AT WASHINGTON, D. C. (ORIGINAL.)

LEAF OF ABUTILON, SHOWING SKELETONIZING OF LEAVES DUE TO LARVÆ OF THE ABUTILON MOTH, LEAVING ONLY THE MAIN RIBS. WASHINGTON, D. C. (ORIGINAL.)

ABUTILON PLANT, SHOWING INCREASED GROWTH AFTER DESTRUCTION OF LARVÆ OF THE ABUTILON MOTH BY SPRAYING WITH NICOTINE SOLUTION. (ORIGINAL.)

shown in Plate IV, figure *b*. It will be noticed that there are only three pairs of prolegs, or prop legs, in addition to the anal pair. This larva when quite young is pale greenish-yellow, showing very little characteristic marking. This is not shown in the figure, because the basis was a photograph, and it could not be filled out on account of the growth of the material after the first photograph.

It will be noticed at first that the larva when extended at full length is decidedly slender, more so than any species of Autographa. The striping is similar to that of *A. brassicæ*, and the larva is inclined to be translucent throughout the stages. When at rest, the body may be held perfectly straight, as in the case of geometrids or inchworms. This habit, together with the coloration, which is very similar to that of its food plant, renders the larva decidedly inconspicuous; indeed, it furnishes a most excellent example of protectional coloration.

Technical descriptions of the different stages follow. That of the adult is from Hampson (8) and those of the immature stages are from Riley (5, 6).

THE ADULT.

♂. Head and thorax orange yellow, irrorated with brown; abdomen brown above. Forewing fuscous, suffused with purple gray; a large yellow patch irrorated with red occupying the whole basal half of wing except the inner margin; irregular ante and post medial red lines meeting at inner margin, the latter produced to an irregular angle beyond the lower angle of cell, then excurved to its lower angle; a white speck in cell; a dentate submarginal line, the area beyond it brown; the cilia white at tips. Hind wing dark fuscous; the cilia white at tips. Underside of forewing with the costal and outer area pale, speckled with red; hind wing pale, the costal area speckled with red.

♀. Bright orange yellow; forewing slightly red speckled and with slight purplish suffusion below the postmedial line; the cilia white at tips.

(Larva. With three pairs of abdominal prolegs. Grass green, with dorsal and lateral series of minute white specks; the prolegs reddish. Food-plant *Hibiscus*.)

THE EGG.

Diameter 0.8 mm., circular, flat below; the upper surface varies somewhat in convexity, in some being almost hemispherical, whilst with others it is quite flat, in general shape and size reminding one of the egg of *Aletia xylina* [*Alabama argillacea*]. Color, pale yellowish green, almost of the same shade as the lower side of the leaves. The number of ribs which run from the base toward the summit varies in different eggs from 31 to 38. Of these ribs from 11 to 13 reach to about one-fourth the distance above the base, 5 to 7 halfway toward the summit, and 16 to 18 to near the summit. The space between these ribs is divided quite constantly by 12 low transverse ribs, which at the intersection with the radiating ribs form a small though quite sharp triangular point, which is especially conspicuous in the empty egg. The spaces between these ribs form shallow, squarish depressions, which are finely granulate. The summit is almost smooth, surrounded with three series of small, roundish cells, which become larger away from the center, and beyond these another series of three rows of larger cells of different shapes, though more or less squarish.

THE LARVA.

First stage.—Length of the newly hatched larva, 2 mm. Color very pale greenish yellow along the dorsum, white and transparent toward the sides; head pale yellowish, without any markings; eyes black, tips of mandibles brown. Antennæ short, 3-jointed; first joint stout, very short and somewhat conical; second joint longest, clavate, its tip obliquely truncate externally, bearing at inner and outer angles a stout spine, which is a little longer than the third joint; third joint shorter than second, cylindrical, with a small tubercle at tip, resembling a fourth joint, and provided at its tip with a fine hair; at the inner side of the third joint, at base of the apical tubercles, arises a stout spine which is almost as long as the joint itself. Piliferous warts, pale brownish, each bearing a long and slender pale hair. Legs rather long, white; only two pairs of prolegs, situated on abdominal joints 8 and 9.

Second stage.—The first molt takes place seven or eight days after hatching; at this time the larvæ differ from the newly hatched specimens only in the somewhat larger size and slightly darker color.

Third stage.—In from six to seven days the second skin is cast, and with this molt appears the third pair of abdominal legs on joint 7. They are, however, extremely small and scarcely noticeable; they are not used in walking. The color now is a darker green, lighter toward the sides, and with a pair of rather indistinct whitish dorsal stripes. Head highly polished, pale, faintly greenish, with two pale, dusky oblique stripes. Cervical shield slightly dusky, with a darker posterior margin. Piliferous warts black, the hairs colorless. The abdominal legs are marked externally with a broad dusky stripe.

Fourth stage.—The third skin is cast six or seven days after the second molt. The larva is now almost of the color of the leaves, and measures about 14 mm. in length. The median and somewhat wavy lateral lines are darker than the rest of the body; the subdorsal stripes and sutures between the joints are white. The prolegs on abdominal joint 7 are now quite distinct, though rather small, and are used in walking.

Fifth stage.—The fourth skin is cast three to five days later, the larva having changed very little in appearance, except that the dorsal and lateral lines and the piliferous warts are distinctly dusky.

Sixth stage.—Five or six days later the fifth skin is shed, and the larva does not change in appeareance.

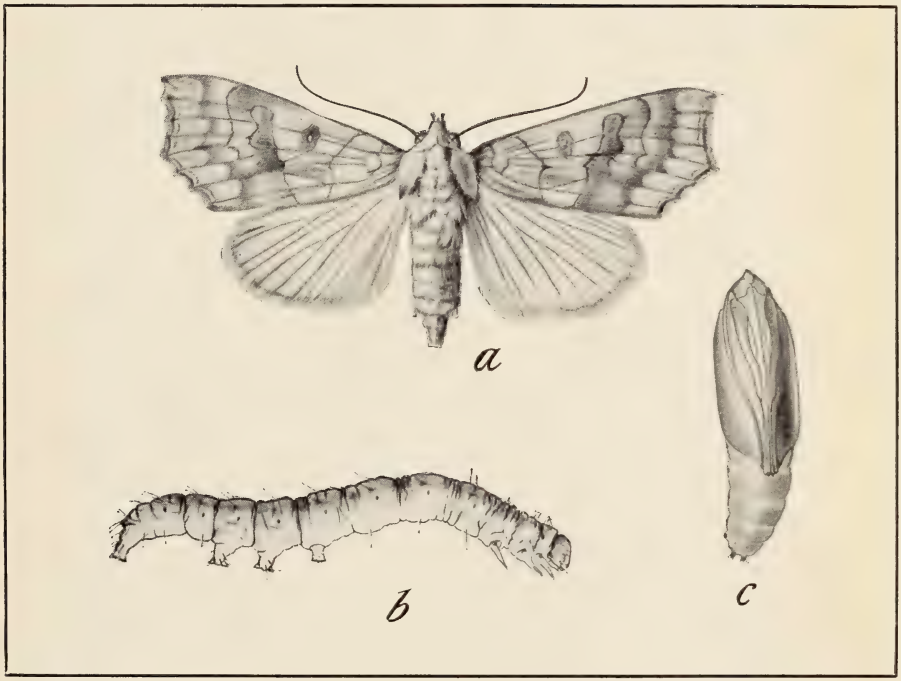
Seventh stage.—The sixth molt takes place about five days after the fifth, and the whole appearance of the insect is considerably changed. The color is pale, translucent, pea-green. The head is not polished, of the color of the body; the two oblique dusky stripes are composed of several irregular spots; the labrum is white, antennæ pale greenish, and the eyes black. The median and the two subdorsal lines are composed of numerous irregular spots of a lemon-yellow color, of which those on median and the lower dorsal lines have a more or less distinctly dusky shade on either side; the lateral line is quite broad and almost white. Piliferous warts pale yellow, surrounded by transversely oval, indistinct, dusky rings. The whole body is speckled with numerous, usually transversely oval, small, lemon-yellow spots, which inclose from two to three almost colorless, glistening, round dots. Stigmata orange. Legs pale green; claws and hooklets pale brown; venter bluish-green.

Length of full-grown larva about 35 mm. (1⅜ inches).

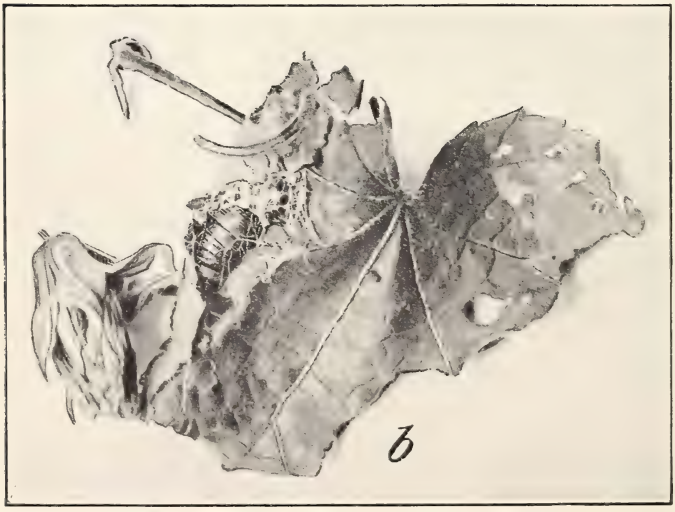
Larvæ at work on an Abutilon leaf are illustrated in Plate V, above.

THE PUPA.

Length, 15 mm. Color, blackish-brown; wing-sheaths opaque, the remaining portion faintly polished. Front of head prolonged into a short, stout, conical projection; near its base ventrally are two fine and quite long hairs and two similar pairs



THE ABUTILON MOTH (COSMOPHILA EROSA): *a*, ADULT; *b*, LARVA, SHOWING ARRANGEMENT OF LEGS; *c*, PUPA. ENLARGED. (ORIGINAL.)



a, ABUTILON LEAF, SHOWING PENULTIMATE STAGE OF LARVA OF THE ABUTILON MOTH NEAR MIDDLE; *b*, PORTION OF PUPA OF THE ABUTILON MOTH AT LEFT ON LEAF, SHOWING PARTIAL CONCEALMENT. (ORIGINAL.)

dorsally near insertion of antennæ. Eyes prominent and considerably polished. Legs reaching to tip of wing-cases; antennæ shorter. Median line of prothorax quite sharp and carinate, median line of mesothorax faintly elevated, somewhat polished. The whole anterior portion of body finely and closely granulated. Metathorax and the three following abdominal segments, with numerous shallow, circular depressions, each having a central granule. The circular depressions on abdominal joints 4–8 are somewhat larger and their margin is slightly elevated; the posterior third of joints 4–6 is of a lighter color than the rest of the body and very closely and quite coarsely granulated, while the posterior third of abdominal joints 7 and 8 is polished and not granulated. The last joint is very peculiarly formed; its tip is broad and prolonged each side into a short, stout, and sharp tooth directed forward, and between these two is a pair of slender and also bristle-like spines, directed forward and with their tips curved in the shape of a loop; another pair of similar bristle-like spines, which are directed forward and inward, are situated, one at each side, on a small projection at the base ventrally of the stout lateral teeth, and between these is a large projection which is armed at its edge with two large, stout, claw-like teeth, which stand at right angles to the body of the pupa. The anal swelling is smooth, circular, and quite prominent; the remaining portions of the tip are marked with coarse, elevated ridges, both dorsally and ventrally.

The pupa is shown in Plate V, below.

EXPERIMENTS IN CONTROL.

The following formula was used for spraying the infested Abutilon:

Nicotine sulphate, 40 per cent	ounce	½
Whale-oil soap	pound	½
Lukewarm water	gallons	5

The whale-oil soap was thoroughly dissolved in 5 gallons of water and the solution, after the addition of the nicotine sulphate, was thoroughly agitated. The plants were sprayed in the morning while some dew remained on them, and in the form of a fine spray or mist from all sides as well as from above and below, the idea being, if possible, to reach every insect on the plants. The weather was calm and clear.

Two days after this treatment about 95 per cent of the larvæ were found dead. Only four or five larvæ were observed to be living, and these, it is believed, came from adjoining unsprayed plants. In a few days the plants began to take on a new appearance, putting out a second growth of leaves. Unfortunately, however, three weeks afterward another lot of larvæ attacked the same plants, although their numbers were much less than on the occasion of the first attack. They were, at the time of discovery, full grown and starting in to do considerable injury.

To complete the experiment, destroy the insects, and save the plants, the same solution was applied again with the result that it entirely eradicated all of the insects, and the Abutilon plants thrived thereafter free from insect attack of any kind up to the end of the season. (See Pl. III.) It is believed that some of the insects were in the egg stage when the spraying was made on the first occasion and that they are not reached when in this condition.

An extremely interesting matter in connection with this injurious occurrence and the application of remedies is that throughout the season of 1913 to October 13 none of the insects made their appearance on the Department grounds where the spraying work was done, showing either the absolute thoroughness of the application or, possibly, that the insect never returned to this particular locality.

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